

**Missouri Department of Natural Resources  
Water Protection Program  
Water Pollution Control Branch  
Engineering Section**

# **Water Quality and Antidegradation Review**

For the Protection of Water Quality  
and Determination of Effluent Limits for Discharge to

Pomme de Terre River  
by  
Missouri Prime Beef Packers



May 2023

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## 1. PURPOSE OF ANTIDEGRADATION REVIEW REPORT

Missouri Prime Beef Packers is a beef processor located one mile north of Pleasant Hope in Polk County. The facility processes approximately 750 cows per day, 5 days per week. The facility currently has an existing land application system that is not sufficient to handle the flows that are generated. The facility wants the ability to discharge at all times, but especially during wet and frozen ground conditions that currently pose a challenge at the site. The proposed discharge is 350,000 gallons per day (gpd) (0.35 MGD) into the Pomme de Terre River.

The applicant elected to assume that all pollutants of concern (POC) will significantly degrade the receiving stream in the absence of existing water quality. An alternatives analysis was conducted to fulfill the requirements of the Antidegradation Implementation Policy (AIP). Information that was provided by the applicant in the submitted report, and summary forms were used to develop this review document.

The following is a review of the Wastewater Treatment Facility Antidegradation Review Report for Missouri Prime Beef Packers dated November 2022 from Cochran Engineering. Additional information was submitted by Collin Tirman from iLeaf Technologies on March 30, 2023 and Donnie Pulley, from Missouri Prime Beef Packers, on the facility's operation with regards to storm water activities.

The preferred treatment technology is iLeaf Technology, which is considered an innovative technology under 10 CSR 20-6.010(5)(E) and 10 CSR 20-8.110(6). The receiving waterbody is Pomme de Terre River. The proposed design flow is 350,000 gpd (0.35 MGD).

## 2. FACILITY INFORMATION

Missouri Prime Beef Packers started processing animals in 2021 as a response to pandemic related issues on animal processing being seen across the country. The facility opened in a previously permitted facility that processed pigs, but changed operations to process cows. The facility had an existing 2-cell lagoon that had not been used since the hog processing operation was active. The facility is currently using this 2-cell lagoon along with a 3<sup>rd</sup> lagoon cell that was constructed in 2021. The facility has been permitted to land apply wastewater from its operations on fields controlled by the facility at the rate of 32 inches per acre per year. The facility has approximately 109 acres available for land application. Even with the proposed discharge, the facility wants to maintain their ability to land apply when possible. (See Appendix A for proposed discharge location and for existing land application fields.)

With the proposed discharge of 350,000 gallons per day, the facility is considered a major facility per EPA's scoring sheet.

Facility Name:	Missouri Prime Beef Packers
Address:	5305 Highway H, Pleasant Hope, MO 65725
Permit #:	MO-0113204
County:	Polk
Facility Type:	Meat processor
Owner:	SDNG, LLC
Continuing Authority:	SDNG, LLC
Secretary of State Charter No.:	FL1433370

Main SIC/ NAICS:	2011/311611
UTM Coordinates:	X = 476369 ; Y = 4149027
Legal Description:	NW ¼, Sec. 20 T32N R21W
12 digit HUC:	10290107-0104
Ecological Drainage Unit:	Ozark/Osage
EcoRegion:	Ozark Highlands

#### A. FACILITY PERFORMANCE HISTORY:

Missouri Prime Beef Packers has been in operation since 2021. The facility has been permitted as a no-discharge facility, with wastewater land applied. The facility has been cited for wastewater running off the site and for issues with the land application equipment. The proposed discharge will help the facility manage their wastewater flows. The facility currently has quarterly monitoring only for ammonia, nitrate, total Kjeldahl nitrogen, total phosphorus, and potassium of the wastewater. In the event of the discharge, the facility will have monitoring for biochemical oxygen demand (BOD), total suspended solids (TSS), ammonia as N, pH, oil and grease, and *E. coli*.

#### B. ANIMAL PROCESSING FACILITY

Missouri Prime Beef Packers is subject to the federal effluent limit guidelines (ELG) for meat processors, [40 CFR 432](#). The facility is considered a new source system. The facility has the capability to process up to 850 cows per day, but averages 750 cows per day. The facility is considered a complex slaughterhouse from the definition in 40 CFR 432.21, *Complex slaughterhouse* means a slaughterhouse that provides extensive processing of the by-products of meat slaughtering. A complex slaughterhouse would usually include at least three processing operations such as rendering, paunch and viscera handling, or processing of blood, hide or hair.

At 750 cows per day, 5 days per week, and assuming the live weight of the cow is 1,000 lbs, the annual live weight killed (LWK) is approximately 195.75 million pounds LWK.

- $261 \text{ days/year} \times 750 \text{ cows/day} \times 1,000 \text{ lbs/cow} = 195.75 \text{ million lbs/year}$

New source for meat processors greater than 50 million pounds LWK per year, 40 CFR 432.25(b)(1) applies for applicable pollutant of concern, which cross references:

- 40 CFR 432.22(a)(1) for applicable requirements for biochemical oxygen demand (BOD), fecal coliform, oil and grease, and total suspended solids (TSS);
- 40 CFR 432.15(b)(1) for ammonia and total nitrogen; and
- 40 CFR 432.3 for pH.

The ELG sets maximum daily load and monthly average loads. Biochemical oxygen demand, oil and grease, and total suspended solids are required to be reported in lbs/day for maximum daily and monthly average per the ELG. Ammonia and total nitrogen are required to be reported in mg/L for maximum daily and monthly average.

The facility plans to operate where animals are not stored onsite overnight, except in cases of emergency, such as equipment failure.

The facility routes impacted stormwater from animal loading areas to the treatment system.

#### C. GEOHYDROLOGIC EVALUATION

A Geohydrologic Evaluation was submitted with the request and the receiving stream is gaining for discharge purposes (see Appendix B). Surface water from the site flows west and north to tributaries of the Pomme de Terre River, in which the tributaries and Pomme de Terre River exhibit gaining characteristics. Based on the

geologic and hydrologic characteristics observed, the site receives a moderate collapse potential rating, primarily due to the depth and size of the proposed lagoon, and moderate geologic limitation rating. In the event of lagoon collapse or wastewater treatment failure, regional groundwater contamination would be minimal, but shallow and local groundwater resources and surface water of Pomme de Terre River and its tributaries may be adversely impacted.

**D. NATURAL HERITAGE REVIEW**

A Missouri Department of Conservation Natural Heritage Review was obtained (Appendix C). Two species of bats, Indiana and Northern Long-Eared, may be present in the project area. The following recommendations were made for construction activities:

- Manage construction to minimize sedimentation and run-off to nearby streams.
- At stream and drainage crossings, avoid erosion, silt introduction, petroleum or chemical pollution, and disruption or realignment of stream banks and beds.
- If any trees need to be removed for the project, contact the U.S. Fish and Wildlife Service for coordination under the Endangered Species Act.

The Natural Heritage Review also identified that fish spawning may occur in Pomme de Terre River and activities that alter or destabilize stream bottoms or banks should be avoided during the fish spawning period of March 15 to June 15.

**3. PERMIT LIMITS AND MONITORING INFORMATION**

The proposed direct discharge will be labeled as Outfall #018 in order to maintain the permitted features and outfalls in the existing operating permit. Flows will be piped from the existing lagoon treatment system to direct discharge to Pomme de Terre River on the north side of their facility.

The ELG sets both daily maximum effluent limits and monthly average limits for all parameters except for total phosphorus. Table 3.1 includes both proposed daily maximum and monthly average total phosphorous effluent limits as concentrations in milligrams per liter (mg/L). The operating permit should include a discussion of mass-based reporting to demonstrate compliance with the ELG. Section 6 contains a discussion and comparison of parameters and effluent limit recommendations.

The facility will be required to do influent monitoring for total phosphorus and total nitrogen per 10 CSR 20-7.015(9)(D)8. because the proposed discharge is greater than 100,000 gpd. Weekly effluent monitoring is required for *E. coli* per 10 CSR 20-7.015(9)(B) and is recommended for the other parameters. This is especially important as the preferred alternative is an innovative technology under 10 CSR 20-6.010 and 10 CSR 20-8.110(6).

It is recommended that the facility be required to report how many days per week it is processing, how many animals are processed per week (or average per week), and the estimated live weight killed (LKW) per week. This reporting will help to demonstrate compliance with the ELG as the comparison in the derivation of limits is based on site assumptions.

Table 3.1 Proposed Effluent Limits for Outfall #018

PARAMETER	Unit	Basis for Limits	Daily Maximum	Monthly Average
Flow	MGD	FSR	*	*
BOD <sub>5</sub>	mg/L	PBA	30	20
TSS	mg/L	PBA	30	20
<i>Escherichia coli</i> **	#/100mL	FSR	630	126
<i>Fecal Coliform</i>	#/100mL	FSR	400	400
Ammonia as N <sup>‡</sup> (January- May) (June) (July) (August) (September) (October- December)	mg/L	WQBEL /FSR	8.0 8.0 8.0 8.0 8.0	4.0 3.6 3.0 2.7 3.7 4.0
Oil & Grease	mg/L	FSR	15	10
Total Phosphorus	mg/L	PBA	*	1.0
Total Nitrogen	mg/L	PBA	*	10
Total Residual Chlorine (TRC) <sup>£</sup>	µg/L	WQBEL	<130	<130
PARAMETER	Unit	Basis for Limits	Minimum	Maximum
pH	SU	FSR	6.0	9.0
PARAMETER	Unit	Basis for Limits	Daily Minimum	Monthly Avg. Min
Dissolved Oxygen (DO)	mg/L	WQBEL	*	*

\* - Monitoring requirement only

\*\* - #/100mL; the Monthly Average for *E. coli* is a geometric mean.

‡- For ammonia as N, the daily maximum and monthly can be calculated by any permit method, however the daily maximum cannot exceed 8.0 mg/L and the monthly average cannot exceed 4.0 mg/L per 40 CFR 432.15(b)(1)

£ The Water Quality Based Effluent Limit for Total Residual Chlorine was calculated to be 20.57 µg/L (daily maximum limit) and 10.25 µg/L (monthly average limit). These limits are below the minimum quantification level (ML) of the most common and practical EPA approved CLTRC methods. The Department has determined the current acceptable ML for total residual chlorine to be 130 µg/L when using the DPD Colorimetric Method #4500 – CL G. from Standard Methods for the Examination of Waters and Wastewater.

**Basis for Limitations Codes:**

FSR– Federal or State Regulation

WQBEL – Water Quality-Based Effluent Limit

TBEL – Technology-Based Effluent Limit

PBA – Performance Based 30 day Average

#### 4. RECEIVING WATERBODY INFORMATION

##### A. RECEIVING WATERBODY

TABLE 4.1: OUTFALL(S) TABLE:

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
#018	0.5425	Tertiary	Industrial

TABLE 4.2: RECEIVING STREAM(S):

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Pomme de Terre River	P	1440	AQL-WWH, HHP, IRR, LWP, SCR, WBC(A)	10290107-0104	0.0

\* **AHP** = Aquatic Habitat Protection - To ensure the protection and propagation of fish, shellfish, and wildlife. AHP is further subcategorized as: **WWH** = Warm Water Habitat; **CLH** = Cool Water Habitat; **CDH** = Cold Water Habitat; **EAH** = Ephemeral Aquatic Habitat; **MAH** = Modified Aquatic Habitat; **LAH** = Limited Aquatic Habitat; **DWS** = Drinking water supply; **GRW** = Groundwater; **HHP** = Human Health Protection as it relates to the consumption of fish; **IND** = Industrial water supply; **IRR** = Irrigation - Application of water to cropland or directly to cultivated plants that may be used for human or livestock consumption; **LWP** = Livestock and wildlife protection - Maintenance of conditions in waters to support health in livestock and wildlife; **WBC** = Whole Body Contact recreation where the entire body is capable of being submerged. WBC is further subcategorized as: **WBC-A** = Whole body contact recreation that supports swimming uses and has public access; **WBC-B** = Whole body contact recreation that supports swimming; **SCR** = Secondary Contact Recreation (like fishing, wading, and boating).

Receiving Water Body Segment Outfall #1:		
Upper end segment* UTM coordinates:	X = 476369 ; Y = 4149027	outfall
Lower end segment* UTM coordinates:	X = 475238 ; Y = 4150284	downstream confluence

\*Segment is the portion of the stream where discharge occurs. Segment is used to track changes in assimilative capacity and is bound at a minimum by existing sources and confluences with other significant water bodies.

##### B. LOSING STREAM ALTERNATIVE DISCHARGE LOCATION

Under 10 CSR 20-7.015(4) (A), discharges to losing stream shall be permitted only after other alternatives including land application, discharge to gaining stream and connection to a regional facility have been evaluated and determined to be unacceptable for environmental and/or economic reasons.

The proposed outfall discharges to Pomme de Terre River, which is a gaining segment at the outfall, see Geohydrologic Evaluation in Appendix B. At this time, there is not a documented losing stream within 5 miles of the proposed discharge.

##### C. MIXING CONSIDERATIONS AND LOW FLOW VALUES

The Proposed Receiving waterbody is Pomme de Terre River, which is a class P stream. The Applicant elected to use USGS StreamStats to establish low flow values. See Appendix D for Stream Stats summary.

TABLE 4.3: RECEIVING STREAM(S) LOW-FLOW VALUES:

RECEIVING STREAM	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Pomme de Terre River	1.46	1.79	2.37

TABLE 4.4: MIXING CONSIDERATIONS TABLE:

MIXING ZONE (CFS) [10 CSR 20-7.031(5)(A)4.B.(II)(a)]			ZONE OF INITIAL DILUTION (CFS) [10 CSR 20-7.031(5)(A)4.B.(II)(b)]		
1Q10	7Q10	30Q10	1Q10	7Q10	30Q10
0.365	0.4475	0.5925	0.0365	0.04475	0.05925

**D. EXISTING WATER QUALITY**

No water quality data was submitted with the Antidegradation Report.

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

- The proposed discharge is to Pomme de Terre River. Pomme de Terre River was previously listed for 303(d) impairment for *E. coli*, however it was delisted for attainment of water quality standards in 2020 and approved by EPA on September 13, 2021. With ELG requirements for fecal coliform and the designated uses on Pomme de Terre for *E. coli*, the facility will still be required to meet bacteria effluent limits for the discharge.
- This facility is considered to be a source of, or has the potential to contribute, total nitrogen and total phosphorus to receiving waters. The proposed discharge is to the Pomme de Terre Lake watershed, which is on the 2020 303(d) list for chlorophyll-a impairments. Chlorophyll-a is an indicator of algae growth in response to increased total phosphorus and total nitrogen in the waterbody. The Department has not developed a total maximum daily load (TMDL) for Pomme de Terre Lake and its watershed. The proposed preferred treatment technology is expected to provide a high level of treatment for nutrients. If a TMDL is developed for Pomme de Terre Lake and its watershed, the facility's permit may be reopened to establish more protective wasteload allocations for total nitrogen and total phosphorus.

**E. RECEIVING STREAM WATER QUALITY MONITORING REQUIREMENTS**

No receiving water monitoring requirements recommended at this time.

**5. ANTIDEGRADATION REVIEW INFORMATION**

In accordance with Missouri's Water Quality Standard [10 CSR 20-7.031(3)] and federal antidegradation policy at Title 40 Code of Federal Regulation (CFR) Section 131.12 (a), the department developed a statewide antidegradation policy and corresponding procedures to implement the policy. A proposed discharge to a water body will be required to undergo a level of Antidegradation Review, which documents that the use of a water body's available assimilative capacity is justified. Effective August 30, 2008, and revised July 13, 2016, a facility is required to use Missouri's AIP for new and expanded wastewater discharges.

The AIP specifies that if the proposed activity results in significant degradation then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required.



This is a review of the Wastewater Treatment Facility Antidegradation Review Report and summary forms found in Appendix E for Missouri Prime Beef Packers dated November 2022 from Cochran Engineering. Additional information was submitted by Collin Tirman from iLeaf Technologies on March 30, 2023, and Donnie Pulley, from Missouri Prime Beef Packers, on the facility's operation with regards to storm water activities.

A. TIER DETERMINATION

Waterbodies are assigned Tier 1, 2, or 3 protection levels.

Tier 1 protection is applied to a waterbody on a pollutant by pollutant basis for pollutants which may cause or contribute to the impairment of a beneficial use or violation of Water Quality Criteria (WQC); and prohibit further degradation of Existing Water Quality (EWQ) where additional pollutants of concern (POCs) would result in the water being included on the 303(d) List.

According to the AIP, the waters may receive the POCs that are causing impairments if 1) the discharge would not cause or contribute to a violation of the WQS, 2) all other conditions of the state permitting requirements are met (i.e., no-discharge options are explored and technology based requirements, including ELGs, are met); and 3) the permit is issued with the highest statutory and regulatory requirements.

Tier 1 Pollutants are total phosphorus and total nitrogen as the facility is located in the Pomme de Terre Lake watershed.

- The proposed discharge is to the Pomme de Terre Lake watershed, which is on the 2020 303(d) list for chlorophyll-a impairments. Chlorophyll-a is an indicator for total phosphorus and total nitrogen exceedances in the waterbody. The Department has not developed a total maximum daily load (TMDL) for Pomme de Terre Lake and its watershed. Following the Department's Nutrient Implementation Policy, the proposed project has an effluent limit of 10 mg/L for total nitrogen and 1.0 mg/L for total phosphorus.
- The proposed preferred treatment technology is expected to provide a high level of treatment for nutrients. If a TMDL is developed for Pomme de Terre Lake and its watershed, the facility's permit may be reopened to establish more protective wasteload allocations for total nitrogen and total phosphorous.

Tier 2 level protection is assigned to the waterbody on a pollutant by pollutant basis that prohibits the degradation of water quality of a surface water unless a review of reasonable alternatives and social and economic considerations justifies the degradation in accordance with the methods presented in the AIP.

- Tier 2 Pollutants are biochemical oxygen demand, total suspended solids, ammonia as N, oil and grease, potassium, pH, and chloride.

Tier 3 protection prohibits any degradation of water quality of Outstanding National Resource Waters and Outstanding State Resource Waters as identified in Tables D and E of the Water Quality Standards (WQS). Temporary degradation of water receiving Tier 3 protection may be allowed by the Department on a case-by-case basis as explained in Section VI of the AIP.

- The proposed discharge is not to an Outstanding State or National Resource Water, and as such is not subject to Tier 3 protections.

Table 5.1 contains a list of POCs reasonably expected and identified by the permittee in their application to be in the proposed discharge. Pollutants of concern are defined as those pollutants "proposed for

discharge that affect beneficial use(s) in waters of the state.” They include pollutants that “create conditions unfavorable to beneficial uses in the water body receiving the discharge or proposed to receive the discharge” (AIP, Page 6).

Table 5.1: Pollutants of Concern and Tier Determination

Pollutants of Concern	Tier	Degradation	Comment
Biological Oxygen Demand (BOD <sub>5</sub> )/DO	2	Significant	ELG parameter
Total Suspended Solids (TSS)	**	Significant	ELG parameter
Ammonia as N	2*	Significant	ELG parameter
<i>Escherichia coli</i> ( <i>E. coli</i> )	2	Significant	State regulation apply
<i>Fecal Coliform</i>	2	Significant	ELG parameter
Phosphorus, Total	1	Significant	Nutrient Implementation Policy
Nitrogen, Total	1	Significant	Nutrient Implementation Policy/ ELG parameter
Oil and Grease	2	Significant	State regulations apply/ELG parameter
pH	***	Significant	State regulations apply/ELG parameter
Total Residual Chlorine	2	Significant	State regulations apply

\* Tier assumed.

\*\* Tier determination not possible: No in-stream standards for these parameters.

\*\*\* Standards for these parameters are ranges.

#### B. NECESSITY OF DEGRADATION

The AIP specifies that if the proposed activity does result in significant degradation then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required. Part of that analysis is the evaluation of non-degrading alternatives, such as regionalization or no discharge systems.

The applicant has the option of assuming the discharge will be significant and proceed directly to the alternatives analysis, thereby avoiding the determination of the assimilative capacity of the receiving water. As the facility has not had a permitted discharge before, this option was selected.

##### i. REGIONALIZATION

The closest municipal treatment plant is Pleasant Hope Wastewater Treatment Facility (MO0108308), which is approximately 0.70 miles from the site. The Pleasant Hope WWTF is a 2-cell lagoon with a design average flow of 115,000 gallons per day and as such does not have the capacity to accept additional flows, especially at the amount being proposed. Other treatment plants in the area include:

- Halfway (MO0128562), which is 10.4 miles away with a design average flow of 30,000 gpd, but does not have the capacity to accept the flows.
- Fair Grove (MO0111708), which is 12.5 miles away with a design average flow of 400,000 gpd but does not have the capacity to accept the flows.
- Bolivar (MO0022373), which is 15.2 miles away with a design average flow of 2.55 MGD with the potential ability to accept additional flows as there is remaining capacity.

The closest treatment plant that has sufficient capacity to accept Missouri Prime Beef Packer’s flow is the Bolivar WWTF, which is 15.2 miles away. The cost for forcemain collection system and pump stations, along with easements, makes regionalization difficult and unaffordable.

##### ii. NO DISCHARGE EVALUATION

At 350,000 gallons per day, and the requirement to hold water for a minimum of 90 days, the facility needs a minimum storage capacity of 31.5 million gallons. To land apply 350,000 gallons per day at 32 inches per acre per year, the facility would need a minimum of 113 acres for surface application.

The facility currently has 109 acres available for surface application, which is not sufficient to meet the proposed flows. The facility currently employs surface land application and is experiencing additional costs to repair and maintain the irrigation system. Additionally, the facility is currently limited on space to discharge.

iii. ALTERNATIVES TO NO DISCHARGE

Three discharging alternatives were evaluated to meet discharge effluent limits. Two included lagoon retrofits and one was a completely new mechanical plant. All three options include the construction of a forcemain and lift station to pump the flows from the treatment area to the Pomme de Terre River. It is estimated that 4,800 lf of forcemain will be required. A comparison of the three alternatives to no discharge can be found in Table 5.2.

i. ALTERNATIVE #1: SAGR

The submerged attached growth reactor (SAGR) consists of a clean stone bed that is fully aerated following a lagoon system. Water flows through the substrate horizontally allowing the bacteria to attach and grow on the media. The system is typically insulated by a layer of mulch at the surface of the bed to prevent ice and allow the system to treat wastewater during winter more reliably. The system would also include the construction of a dissolved air floatation (DAF) system to aid in treatment. The issue with the SAGR system is that it is typically recommended for flows of 50,000 to 100,000 gpd. Flows that exceed these limits create a large footprint comparable to that of a suspended growth facility such as an aerated lagoon. Cost increases with this increased footprint. Phosphorus can be eliminated biologically the same as an aerated lagoon. To get to <1 mg/L, additional chemical treatment is necessary. Year round disinfection would be required to meet the ELG limit for fecal coliform and the seasonal *E. coli* water quality standard. The estimated construction costs is \$7,397,757 with an annual operations and maintenance cost of \$114,622.

ii. ALTERNATIVE #2: SCHREIBER CSBR

The Schreiber Continuously Sequencing Reactor, or CSR, is a Biological Nutrient Removal (BNR) system contained in a single basin. It produces the three process phases required for Biological Nutrient Removal – oxic, anoxic, and anaerobic – in one basin, performed sequentially and repetitively over time. During the oxic phase, the entire basin is oxic (aerobic). When the air is turned off, the entire basin becomes anoxic and then ultimately anaerobic. The air is then turned back on and the cycle repeats. This system's unique design allows for complete separation of aeration and mixing. It has a 100 % aeration turnaround capability, turning off the aeration while the CSR applies low-energy, biologically friendly, flocculant mixing – without adding air. Separate of the CSR, it is expected that this system would also require the installation of a DAF system. The CSR process can be advanced to meet the most stringent nutrient removal requirements for today and the future. The basic single-basin CSR configuration consists of one circular basin with a rotating bridge that supplies both the low energy mixing and the mixing-independent aeration to achieve Biological Nutrient Removal in a single basin. Year round disinfection would be required to meet the ELG limit for fecal coliform and the seasonal *E. coli* water quality standard. The estimated construction cost is \$8,507,932 with an annual operation and maintenance cost of \$162,881.

iii. ALTERNATIVE #3: ILEAF TECHNOLOGY

The ILEAF is an innovative wastewater treatment design that utilizes live liquid microorganisms, or a Specific Enzyme Bacterial System (SEBS), to digest biological contaminants in the beef, pork, and poultry industry. The SEBS digest biological oxygen demand (BOD); total suspended solids (TSS); chemical oxygen demand (COD); fat, oil, and grease; and total Kjeldahl nitrogen. The microorganisms have also been shown to digest *E. coli* and fecal coliform bacteria to acceptable levels for discharge, eliminating the need for disinfection by chlorination or ultra-violet light prior to discharge. The use of the microorganisms for treatment eliminates odors by reducing hydrogen sulfide formation.

The organisms liquefy crust and floating solids within the basin. The microorganisms also digest hydrocarbons and other solid waste present in the basin, eliminating sludge formation and increasing holding capacity within the treatment basin.

The ILEAF system utilizes a full spectrum of microorganisms that are aerobic, facultative, and anaerobic in nature. The storage lagoon or basin that the SEBS bacteria are released into will form horizontal digestive layers within the basin. The aerobic bacteria will form the top layer and will target the fats, oil, and grease, along with digesting the BOD and TSS, which float on the surface. The middle layer is comprised of the facultative bacteria group that targets and feeds on dissolved solids, phosphate, and ammonia. The bottom layer is the anaerobic bacteria group that targets the bottom sludge, BOD, and ammonia. These different types of bacterial microorganisms allow ILEAF to treat the broad spectrum of waste and organic loading that is produced by industrial processing plants. To ensure oxygen is present for the aerobic bacteria to survive, aeration by mechanical mixers or suspended diffusers is necessary for the ILEAF system. The aeration provides the necessary oxygen to the bacteria, while also circulating all levels of the treatment basin for the bacteria to consume available food/contaminants.

At the influent pipe discharge to Cell #3, Mobile Unit 1 will use the dosing pump that will inject a SEBS mixture into the flow to begin the treatment process. The microbes for the SEBS will be housed in an enclosed container to the east of Cell #3. The dosing level will be monitored by a magnetic flow meter and automated sensors located in the influent line and lagoon cell. All three of the cells will be aerated with disc diffusers and be controlled by the same automated sensors measuring dissolved oxygen levels. Cell #3 treatment will be to liquefy the solids, perform nitrification for removal of ammonia, and reduce oil and fats. Aerobic, facultative, and anaerobic treatment processes as described above for the ILEAF system will occur in Cell #3. The retention time in Cell #3 will allow the facultative middle layer of bacteria to remove phosphorus. The microbes will convert the phosphorus in the wastewater to phosphoric acid. This phosphoric acid will be used by other microbes in the dosing mixture to convert into carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>).

The liquid waste will then be pumped from Cell #3 to Cell #1, operated by Mobile Unit 2, which will continue the treatment process. The semi-treated wastewater shall be dosed again with a SEBS mixture at the influent to Cell #1. Anaerobic treatment process will occur in Cell #1. BOD and TSS will be eliminated further in this cell along with additional phosphorus treatment. The nitrification process will continue in this cell for removal of ammonia. The anaerobic microbes will digest and liquefy organic sludge to reduce the overall level of phosphorus in the water. Finally, the liquid waste will flow by gravity from Cell #1 to Cell #2 for final treatment and then discharge. A final dosing mixture, from Mobile Unit 2, of SEBS shall be added to the influent line at Cell #2. The main treatment process in this cell will be aerobic in nature. This final cell is for treatment of BOD and TSS to acceptable discharge levels. Microbes will be added for the treatment and removal of *E. coli* and fecal coliform. The estimated construction cost is \$2,266,055 with an annual operation and maintenance cost of \$60,800.

Table 5.2: Alternatives Analysis Comparison

Pollutant	Alternative 1 SAGR	Alternative 2 Schreiber CSBR	Alternative 3 ILEAF
BOD <sub>5</sub>	≤ 10 mg/l	≤ 30 mg/l	≤ 30 mg/l
TSS	≤ 10 mg/l	≤ 30mg/l	≤ 30 mg/l
Ammonia as N-summer	≤ 1.0 mg/l	3-5 mg/l	3-5 mg/l
Ammonia as N-winter	1-5 mg/l	3-5 mg/l	3-5 mg/l
<i>E. coli</i>	Disinfection required	Disinfection required	≤ 126 CFU/100ml
Phosphorus, Total	≤ 1.0 mg/l	≤ 1.0 mg/l	≤ 1.0 mg/l
Life Cycle Cost**	\$8,826,197	\$10,537,786	\$3,023,757

Ratio	2.92%	3.48%	1.0%
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\*\*Life cycle cost at 20 year design life and 5.0% interest

iv. STORMWATER

The Missouri Prime Beef Packers facility is a major industrial facility, subject to stormwater requirements per 10 CSR 20-6.200 and 40 CFR 122.26(b)(14)(ix), ), the facility is required to have a detailed Stormwater Pollution Prevention Plan (SWPPP).. Stormwater impacted by animal holding, transportation, and offloading is regulated as wastewater under the federal Effluent Limit Guidelines in 40 CFR 432.

The facility shall select, install, use, operate, and maintain the Best Management Practices (BMPs) prescribed in the SWPPP in accordance with the concepts and methods described in: Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators, (EPA 833-B-09-002 March 2021), [https://www.epa.gov/sites/production/files/2021-03/documents/swppp\\_guide\\_industrial\\_2021\\_030121.pdf](https://www.epa.gov/sites/production/files/2021-03/documents/swppp_guide_industrial_2021_030121.pdf)

The Department does not review the SWPPP, as the SWPPP is a living document with ongoing evaluation of BMPs as the site continues to change with the industrial activities. The SWPPP must be kept up to date and be available upon request for inspection. The SWPPP shall identify reasonable and effective BMPs while accounting for environmental impacts of varying control methods. Within the SWPPP, there include a discussion of why no discharge and no exposure are not feasible options on the site. Within the SWPPP, the BMPs selected must be the most reasonable and effective management strategy for the site, while ensuring the highest statutory and regulatory requirements are achieved and the highest quality water attainable for the facility is discharged.

Stormwater runoff is based on frequency and intensity of precipitation and site conditions. BMPs are very site specific and dependent on the activities occurring onsite, the topography of the site, site size, county ordinances, the precipitation events, and wind direction. For potential BMPs for the site, the facility could utilize:

- [National Menu of Best Management Practices for Stormwater](#)
- [Protecting Water Quality Field Guide](#)
- [Minnesota Pollution Control Agency's Industrial Stormwater BMP Guidebook](#)
- [Nevada Best Management Practices Handbook](#)
- [Idaho Catalog of Storm Water Best Management Practices](#)

Impacted stormwater is to be collected and diverted to the lagoon system.

C. SOCIAL AND ECONOMIC IMPORTANCE

The affected community consists of the employees of Missouri Prime Beef Packers and the residents of Pleasant Hope and Polk County. The facility employs approximately 400 individuals to process the 750 cattle that are received each day. Processing such a large number of animals per day at the facility provides food to the state and others by shipping meat to grocery stores. As a large employer in the area, Missouri Prime Beef Packers provides a stable income to its employees, a tax base for the community and county to provide additional services, and revenue to the state. Pleasant Hope is a community that has experienced higher levels of families receiving food stamps, and lower median household income than the state as a whole. Having a large employer that provides jobs is a benefit. Proper and cost-effective operation of the facility serves the environmental and economic interests of both the State of Missouri and the local communities.

6. DERIVATION AND DISCUSSION OF PARAMETERS AND LIMITS

Wasteload allocations and limits were calculated using two methods:

A. **Water quality-based** – Using water quality criteria or water quality model results and the dilution equation below:

$$C = \frac{(C_s \times Q_s) + (C_e \times Q_e)}{(Q_e + Q_s)} \quad (\text{EPA/505/2-90-001, Section 4.5.5})$$

Where  
 C = downstream concentration  
 C<sub>s</sub> = upstream concentration  
 Q<sub>s</sub> = upstream flow  
 C<sub>e</sub> = effluent concentration  
 Q<sub>e</sub> = effluent flow

Chronic wasteload allocations were determined using applicable chronic water quality criteria (CCC: criteria continuous concentration) and stream volume of flow at the edge of the mixing zone (MZ). Acute wasteload allocations were determined using applicable water quality criteria (CMC: criteria maximum concentration) and stream volume of flow at the edge of the zone of initial dilution (ZID).

Water quality-based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

B. **Alternative Analysis-based** – Using the preferred alternative's treatment capacity for conventional pollutants such as BOD<sub>5</sub> and TSS that are provided by the consultant as the WLA, the significantly-degrading effluent average monthly and average weekly limits are determined by applying the WLA as the average monthly (AML) and multiplying the AML by 1.5 to derive the average weekly limit (AWL).

Note: Significantly-degrading effluent limits have been based on the authority included in Section I.A. of the AIP. Also, under 40 CFR 133.105, permitting authorities shall require more stringent limitations than equivalent to secondary treatment limitations for 1) existing facilities if the permitting authority determines that the 30-day average and 7-day average BOD<sub>5</sub> and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, and 2) new facilities if the permitting authority determines that the 30-day average and 7-day average BOD<sub>5</sub> and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, considering the design capability of the treatment process.

#### Outfall #001 – Main Facility Outfall

- **Flow.** Though not limited itself, the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations [40 CFR Part 122.44(i)(1)(ii)]. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification. Influent monitoring has been and will be required for this facility in its Missouri State Operating Permit.
- **Biochemical Oxygen Demand (BOD<sub>5</sub>).** Proposed performance based effluent limits are 30 mg/L daily maximum and 20 mg/L monthly average. These limits are at least as stringent as the effluent limit guidelines established in 40 CFR 432.22(a)(1). For the facility, dissolved oxygen modeling and preliminary modeling for Pomme de Terre watershed was completed to determine the required water quality to protect the beneficial uses. Those values were compared with the ELG limits based on annual live kill weight, assuming 750 cows per day both in the ELG mass reporting units and the equivalent in concentration limits with a design flow of 350,000 gpd.

	Units <sup>‡</sup>	ELG daily max	ELG monthly average
Biochemical Oxygen Demand (BOD)	lbs/day	315	157.5
	mg/L	107.9	53.96

<sup>‡</sup>To convert from lbs/day to mg/L = 315 lbs/day/0.35MGD/8.345 = 107.9 mg/L

The dissolved oxygen modeling completed by Cochran Engineering showed that a BOD level of 30 mg/L daily maximum would be protective of the instream standard for dissolved oxygen.

- **Total Suspended Solids (TSS).** Proposed performance based effluent limits are 30 mg/L daily maximum and 20 mg/L monthly average. These limits are at least as stringent as the effluent limit guidelines established in 40 CFR 432.22(a)(1). For the facility, preliminary modeling and reasonable potential for Pomme de Terre watershed was completed to determine the required water quality to protect the beneficial uses and not contribute to the impairment. Those values were compared with the ELG limits based on annual live kill weight, assuming 750 cows per day both in the ELG mass reporting units and the equivalent in concentration limits with a design flow of 350,000 gpd.

	Units <sup>¥</sup>	ELG daily max	ELG monthly average
Total Suspended Solids	lbs/day	375	187.5
	mg/L	128.47	64.23

¥To convert from lbs/day to mg/L = 375 lbs/day/0.35MGD/8.345 = 128.47 mg/L

The dissolved oxygen modeling completed by Cochran Engineering showed that a TSS level of 30 mg/L daily maximum would be protective of the instream standard for dissolved oxygen.

- **Oil & Grease.** Proposed performance based effluent limits are 15 mg/L daily maximum and 10 mg/L monthly average. These limits are more stringent than effluent limit guidelines established in 40 CFR 432.22(a)(1), as oil and grease is a conventional pollutant covered in 10 CSR 20-7.031(4)(B) with a water quality standard of 10 mg/L/. Waters shall be free from oil, scum, and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. To verify that the water quality standard values were more protective, they were compared with the ELG limits based on annual live kill weight, assuming 750 cows per day both in the ELG mass reporting units and what that would translate in concentration limits with a design flow of 350,000 gpd

	Units <sup>¥</sup>	ELG daily max	ELG monthly average
Oil and Grease	lbs/day	160	80
	mg/L	54.81	27.41

¥To convert from lbs/day to mg/L = 160 lbs/day/0.35MGD/8.345 = 54.81 mg/L

- **Fecal Coliform.** Effluent limits of 400 CFU per 100 mL daily maximum and monthly average established in 40 CFR 432.22(a)(1). The fecal coliform limit is effective year round, not just seasonally.
- **Escherichia coli (E. coli).** Effluent limits of 126 CFU per 100 mL monthly average and 630 CFU per 100 mL as a daily max of geometric mean during the recreation season (April 1 – October 31) were established, as per 10 CSR 20-7.015(9)(B).
- **Total Ammonia Nitrogen.** Proposed performance based effluent limits were based on the existing water quality based effluent limits for the Ozark Highlands and the mixing provided by the Pomme de Terre River on a monthly basis. 40 CFR 432.15(b)(1) sets ammonia as N maximum daily and monthly average limits. As there are multiple ways to calculate effluent limits, the recommendation of this review is to calculate based on the current permit method. However, the ELG limits the daily maximum at any time to 8.0 mg/L and the highest monthly average to 4.0 mg/L. The proposed monthly average limits are more protective than the ELG monthly average for June through September. As the facility's design flow is greater than 100,000 gpd, per 10 CSR 20-7.015(9)(D), influent monitoring is required for total nitrogen.

	Units	ELG MDL	ELG AML
Ammonia as N	mg/L	8.0	4.0

For the facility, preliminary modeling for Pomme de Terre watershed was completed to determine the required water quality to protect the beneficial uses and not contribute to the impairment at the water quality based effluent limits. The dissolved oxygen modeling completed by Cochran Engineering showed that the summer water quality based effluent limits would be protective of the instream standard for dissolved oxygen.

To compare the ELG to the water quality based effluent limits, the Ozark Highlands temperature and pH were used as well as the Early Life Stages Present Total Ammonia Nitrogen criteria [10 CSR 20-7.031(5)(B)7.C. & Table B3]. Background total ammonia nitrogen = 0.01 mg/L

Ammonia as N	Units	MDL	AML	ELG/WQBEL
January- May	mg/L	8.0	4.0	ELG
June	mg/L	8.0	3.6	WQBEL
July	mg/L	8.0	3.0	WQBEL
August	mg/L	8.0	2.7	WQBEL
September	mg/L	8.0	3.7	WQBEL
October-December	mg/L	8.0	4.0	ELG

#### January

Chronic WLA:  $C_e = ((0.5425 + 0.5925)3.1 - (0.5925 * 0.01)) / 0.5425$  Ce = 6.5  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 13  
 AML = WLA<sub>Ac</sub> = 6.5 mg/L  
 MDL = WLA<sub>Aa</sub> = 13 mg/L

#### February

Chronic WLA:  $C_e = ((0.5425 + 0.5925)2.7 - (0.5925 * 0.01)) / 0.5425$  Ce = 5.7  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)10.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 10.8  
 AML = WLA<sub>Ac</sub> = 5.7 mg/L  
 MDL = WLA<sub>Aa</sub> = 10.8 mg/L

#### March

Chronic WLA:  $C_e = ((0.5425 + 0.5925)3.1 - (0.5925 * 0.01)) / 0.5425$  Ce = 6.5  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 13  
 AML = WLA<sub>Ac</sub> = 6.5 mg/L  
 MDL = WLA<sub>Aa</sub> = 13 mg/L

#### April

Chronic WLA:  $C_e = ((0.5425 + 0.5925)2.7 - (0.5925 * 0.01)) / 0.5425$  Ce = 5.7  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 13  
 AML = WLA<sub>Ac</sub> = 5.7 mg/L  
 MDL = WLA<sub>Aa</sub> = 13 mg/L

#### May

Chronic WLA:  $C_e = ((0.5425 + 0.5925)2.2 - (0.5925 * 0.01)) / 0.5425$  Ce = 4.6  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 13  
 AML = WLA<sub>Ac</sub> = 4.6 mg/L  
 MDL = WLA<sub>Aa</sub> = 13 mg/L

#### June

Chronic WLA:  $C_e = ((0.5425 + 0.5925)1.7 - (0.5925 * 0.01)) / 0.5425$  Ce = 3.6  
 Acute WLA:  $C_e = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425$  Ce = 13  
 AML = WLA<sub>Ac</sub> = 3.6 mg/L  
 MDL = WLA<sub>Aa</sub> = 13 mg/L



## July

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)1.5 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 3.0$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 13$$

$$\text{AML} = \text{WLA}c = 3.0 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 13 \text{ mg/L}$$

## August

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)1.3 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 2.7$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)10.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 10.8$$

$$\text{AML} = \text{WLA}c = 2.7 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 10.8 \text{ mg/L}$$

## September

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)1.8 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 3.7$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 13$$

$$\text{AML} = \text{WLA}c = 3.7 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 13 \text{ mg/L}$$

## October

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)2.5 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 5.2$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 13$$

$$\text{AML} = \text{WLA}c = 5.2 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 13 \text{ mg/L}$$

## November

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)3.1 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 6.5$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 13$$

$$\text{AML} = \text{WLA}c = 6.5 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 13 \text{ mg/L}$$

## December

$$\text{Chronic WLA: } Ce = ((0.5425 + 0.5925)3.1 - (0.5925 * 0.01)) / 0.5425 \quad Ce = 6.5$$

$$\text{Acute WLA: } Ce = ((0.5425 + 0.0365)12.1 - (0.0365 * 0.01)) / 0.5425 \quad Ce = 13$$

$$\text{AML} = \text{WLA}c = 6.5 \text{ mg/L}$$

$$\text{MDL} = \text{WLA}a = 13 \text{ mg/L}$$

- **Total Residual Chlorine (TRC).** Discussions with the facility on May 5, 2023 revealed that it would like the ability to provide disinfection in case of emergency if there is an issue with the iLeaf SEBS system to maintain compliance with fecal coliform and *E. coli* effluent limits. Warm-water Protection of Aquatic Life CCC = 11 µg/L, CMC = 19 µg/L [10 CSR 20-7.031, Table A]. Background TRC = 0.0 µg/L.

$$\text{Acute AQL: } 19 \text{ µg/L}$$

$$\text{Chronic AQL: } 11 \text{ µg/L}$$

$$\text{Acute WLA: } Ce = ((0.542 + 0.04475) * 19 - (0.04475 * 0)) / 0.542 = 20.5700884240931$$

$$\text{Chronic WLA: } Ce = ((0.542 + 0.4475) * 11 - (0.4475 * 0)) / 0.542 = 20.09$$

$$\text{LTAA: } \text{WLA}a * \text{LTAA multiplier} = 20.5700884240931 * 0.321 = 6.605$$

$$\text{LTAc: } \text{WLA}c * \text{LTAc multiplier} = 20.09 * 0.527 = 10.596$$

$$\text{Use most protective LTA: } 6.605$$

$$\text{Daily Maximum: } \text{MDL} = \text{LTA} * \text{MDL multiplier} = 6.605 * 3.114 = 20.57 \text{ µg/L}$$

$$\text{Monthly Average: } \text{AML} = \text{LTA} * \text{AML multiplier} = 6.605 * 1.552 = 10.253 \text{ µg/L}$$

The Water Quality Based Effluent Limit for Total Residual Chlorine was calculated to be 20.57 µg/L (daily maximum limit) and 10.25 µg/L (monthly average limit). These limits are below the minimum quantification level (ML) of the most common and practical EPA approved CLTRC methods. The Department has determined

the current acceptable ML for total residual chlorine to be 130 µg/L when using the DPD Colorimetric Method #4500 – CL G. from Standard Methods for the Examination of Waters and Wastewater. The permittee will conduct analyses in accordance with this method, or equivalent, and report actual analytical values. Measured values greater than or equal to the minimum quantification level of 130 µg/L will be considered violations of the permit and values less than the minimum quantification level of 130 µg/L will be considered to be in compliance with the permit limitation.

- **Total Phosphorus. Proposed performance based effluent limits is 1.0 mg/L monthly average.** The proposed discharge limit is based on the Department's proposed Total Phosphorus Rule and the Department's Nutrient Implementation Plan. As the proposed facility will be considered a major industrial facility, it would be subject to the proposed total phosphorus rule. Additionally, to protect the Pomme de Terre Lake watershed which is impaired for nutrients, the facility is proposing a 1.0 mg/L effluent limit.

As the facility's design flow is greater than 100,000 gpd, per 10 CSR 20-7.015(9)(D), influent monitoring is required for total phosphorus.

- **Total Nitrogen. Proposed performance based effluent limits is 10 mg/L monthly average.** These limits are at least as stringent as the effluent limit guidelines established in 40 CFR 432.15(b)(1). For the facility, preliminary modeling for Pomme de Terre watershed was completed to determine the required water quality to protect the beneficial uses and not contribute to the impairment. 40 CFR 432.15(b)(1) sets concentration based effluent limits for total nitrogen; however, from the preliminary modeling done on Pomme de Terre watershed and the Department's Nutrient Implementation Plan, total nitrogen must be reduced to 10 mg/L. The dissolved oxygen modeling also set the total nitrogen to less than 10 mg/L to protect the instream standard for dissolved oxygen.

	Units	ELG MDL	ELG AML
Total Nitrogen	mg/L	194	134

As the facility's design flow is greater than 100,000 gpd, per 10 CSR 20-7.015(9)(D), influent monitoring is required for total nitrogen.

- **pH.** The preferred alternative selected for ammonia treatment serves as the base case for pH with effluent limit range of 6.0-9.0 SU. Technology based limits, 6.0/9.0 SU [10 CSR 20-7.015] are protective of the water quality standard [10 CSR 20-7.031(5)(E)], due to the buffering capacity of the mixing zone and meets the requirements of 40 CFR 432.3.

## 7. ILEAF INNOVATIVE TECHNOLOGY DISCUSSION & PERMIT RECOMMENDATION

The Department considers iLeaf Technology to be an innovative technology under 10 CSR 20-6.010(5)(E) and 10 CSR 20-8.110(6). The iLeaf technology is a microbial treatment process within the earthen basins with aeration and dosing of bacteria. The iLeaf technology has been used in Arkansas for another meat processor, and is being explored for other applications.

As an innovative technology, the facility will need to have frequent monitoring of the influent and the discharge to verify the technology works to remove the pollutants of concern and is protective of water quality. Innovative technologies have an additional permit condition requiring the facility to submit a report after collecting a minimum of one year of additional data. The report after the first year of operation must include a discussion of the technology, the dosing of the microbes, any upset conditions that were experienced and how they were addressed, and any challenges in meeting effluent limits established in the operating permit per 10 CSR 20-8.110(6)(C).

## **8. GENERAL ASSUMPTIONS OF THE WATER QUALITY AND ANTIDEGRADATION REVIEW**

- A. A Water Quality and Antidegradation Review (WQAR) assumes that Continuing Authorities [10 CSR 20-6.010(2)] and consideration for no discharge [10 CSR 20-6.010(4)(A)5.B.] has been or will be addressed in a Missouri State Operating Permit or Construction Permit Application.
- B. A WQAR does not indicate approval or disapproval of alternative analysis as per 10 CSR 20-7.015(4), Losing Streams, and/or any section of the effluent regulations.
- C. Changes to Federal and State Regulations (FSR) made after the drafting of this WQAR may alter Water Quality Based Effluent Limits (WQBEL).
- D. Effluent limitations derived from FSR may be WQBEL or Effluent Limit Guidelines (ELG).
- E. WQBEL supersede ELG only when they are more stringent. Mass limits derived from technology based limits are still appropriate.
- F. A WQAR does not allow discharges to waters of the State, and shall not be construed as a National Pollution Discharge Elimination System (NPDES) or Missouri State Operating Permit to discharge or a permit to construct, modify, or upgrade.
- G. Limitations and other requirements in a WQAR may change as Water Quality Standards (WQS), Methodology, and Implementation procedures change.
- H. Nothing in this WQAR removes any obligations to comply with county or other local ordinances or restrictions.
- I. The proposed treatment technology is not covered in 10 CSR 20-8 Design Guides, the treatment process is considered a new technology. As a new technology, the permittee will need to work with the review engineer to ensure equipment is sized properly. The operating permit will contain additional requirements to evaluate the effectiveness of the technology once the facility is in operation. This Antidegradation Review is based on the information provided by the facility and is not a comprehensive review of the proposed treatment technology. If the proposed technology will not consistently meet proposed effluent limits, the permittee will be required to revise their Antidegradation Report.

## **9. ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION**

The proposed new facility discharge location will result in significant degradation of Pomme de Terre River. The base case was determined by the owner and facility to be the iLeaf Technology, which utilizes a microbes for treatment to meet the necessary water quality based effluent limits to protect the downstream uses of Pomme de Terre River, Pomme de Terre Lake and its watershed. The other technologies evaluated were not cost effective and not selected as the preferred technology. However, as the iLeaf Technology is an innovative technology, if the facility has trouble meeting the effluent limits established in this Antidegradation Review or through the permitting process, another technology may be required to be installed or the facility will have to explore additional options.

Per the requirements of the AIP, the effluent limits in this review were developed to be protective of beneficial uses and to attain the highest statutory and regulatory requirements. The Department has determined that the submitted review is sufficient and meets the requirements of the AIP. No further analysis is needed for this discharge.

Reviewer: Leasue Meyers, EI

Date: May 15, 2023

Reviewer: Cailie Carlile, P.E.

**Appendix A: Map of Discharge Location**



**Appendix B: Geohydrologic Evaluation**



November 20, 2020

William Johanning  
530A East Independence Drive  
Union, MO 63084

**RE: Missouri Prime Beef Packers**

Dear William Johanning:

On October 06, 2020, the Missouri Geological Survey received a request to perform a geohydrologic evaluation for the above referenced project located in Polk County. Included with this letter is a report that details the geologic and hydrologic conditions at the site and the potential for groundwater contamination in the event of wastewater treatment failure.

Thank you for the evaluation request. If you are in need of further assistance or have questions regarding the report, please contact our office at P.O Box 250, Rolla, Mo 65402-0250, by telephone at 573-368-2100 or [gspgeol@dnr.mo.gov](mailto:gspgeol@dnr.mo.gov).

Sincerely,


MISSOURI GEOLOGICAL SURVEY

John Corley  
Geologist  
Environmental Geology Section


c: Dallen Davies  
WPP  
Southwest Regional Office



11/20/2020

	<b>Missouri Department Of Natural Resources</b> Missouri Geological Survey Geological Survey Program Environmental Geology Section	<b>Project ID Number</b> <b>LWE21027</b> <b>County</b> <b>Polk</b>
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Request Details</b></p> <p style="text-align: center;">Project: Missouri Prime Beef Packers</p> <p><u>Organization Official</u></p> <p>Name: Dallen Davies            Address: 5305 Highway H            City: Pleasant Hope            State: MO Zip: 65725            Phone: 541-390-7034            Email: dallen@mpbeef.com</p> </div> <div style="width: 45%;"> <p>Legal Description: 20 T32N R21W            Quadrangle: PLEASANT HOPE            Latitude: 37 28 51.18            Longitude: -93 16 16.25</p> <p><u>Preparer</u></p> <p>Name: William Johanning            Address: 530A East Independence Drive            City: Union            State: MO Zip: 63084            Phone: 636-584-0540            Email: rjohanning@cochraneng.com</p> </div> </div>		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Project Details</b></p> <p>Report Date: 11/20/2020            Date of Field Visit: 11/05/2020</p> </div> <div style="width: 45%;"> <p>Previous Reports: Not Applicable</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 30%;"> <p><u>Facility Type</u></p> <p><input type="checkbox"/> Mechanical treatment plant</p> <p><input type="checkbox"/> Recirculating filter bed</p> <p><input type="checkbox"/> Land application</p> <p><input type="checkbox"/> Lagoon or storage basin</p> <p><input type="checkbox"/> Subsurface soil absorption system</p> <p><input checked="" type="checkbox"/> Lagoon or storage basin W/Land App</p> <p><input type="checkbox"/> Lagoon or storage basin W/SSAS</p> <p><input type="checkbox"/> Other type of facility</p> </div> <div style="width: 30%;"> <p><u>Type of Waste</u></p> <p><input type="checkbox"/> Animal</p> <p><input type="checkbox"/> Human</p> <p><input checked="" type="checkbox"/> Process or industrial</p> <p><input type="checkbox"/> Leachate</p> <p><input type="checkbox"/> Other waste type</p> </div> <div style="width: 30%;"> <p><u>Funding Source</u></p> <p><input checked="" type="checkbox"/> IWT</p> <p><input type="checkbox"/> WWL-SRF</p> <p><u>Additional Information</u></p> <p><input type="checkbox"/> Plans were submitted</p> <p><input type="checkbox"/> Site was investigated by NRCS</p> <p><input type="checkbox"/> Soil or geotechnical data were submitted</p> </div> </div> <p><b>Geologic Stream Classification:</b> <input type="checkbox"/> Gaining <input type="checkbox"/> Losing <input checked="" type="checkbox"/> No discharge</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 25%;"> <p><u>Overall Geologic Limitations</u></p> <p><input type="checkbox"/> Slight</p> <p><input checked="" type="checkbox"/> Moderate</p> <p><input type="checkbox"/> Severe</p> </div> <div style="width: 25%;"> <p><u>Collapse Potential</u></p> <p><input type="checkbox"/> Not applicable</p> <p><input type="checkbox"/> Slight</p> <p><input checked="" type="checkbox"/> Moderate</p> <p><input type="checkbox"/> Severe</p> </div> <div style="width: 25%;"> <p><u>Topography</u></p> <p><input checked="" type="checkbox"/> &lt;4%</p> <p><input checked="" type="checkbox"/> 4% to 8%</p> <p><input type="checkbox"/> 8% to 15%</p> <p><input type="checkbox"/> &gt;15%</p> </div> <div style="width: 25%;"> <p><u>Landscape Position</u></p> <p><input type="checkbox"/> Broad uplands <input type="checkbox"/> Floodplain</p> <p><input type="checkbox"/> Ridgetop <input type="checkbox"/> Alluvial plain</p> <p><input checked="" type="checkbox"/> Hillslope <input type="checkbox"/> Terrace</p> <p><input type="checkbox"/> Narrow ravine <input type="checkbox"/> Sinkhole</p> </div> </div> <p><b>Bedrock:</b> Bedrock consists of moderately permeable Ordovician-age Jefferson City-Cotter Dolomite.</p> <p><b>Surficial Materials:</b> Surficial materials consist of moderate to highly permeable silty, clayey, and gravelly residuum.</p>		



 <b>Missouri Department Of Natural Resources</b> Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number <b>LWE21027</b> County Polk
<b><u>Recommended Construction Procedures for Earthen Facility</u></b> <input checked="" type="checkbox"/> Installation of clay pad and Compaction <input type="checkbox"/> Diversion of subsurface flow <input type="checkbox"/> Artificial sealing <input type="checkbox"/> Rock excavation <input checked="" type="checkbox"/> Limit excavation depth	<b><u>Determine Overburden Properties</u></b> <input checked="" type="checkbox"/> Particle size analysis <input checked="" type="checkbox"/> Atterberg limits <input type="checkbox"/> 95% Max. dry density test method <input type="checkbox"/> Overburden thickness <input type="checkbox"/> Permeability coefficient-undisturbed <input checked="" type="checkbox"/> Permeability coefficient-remolded	<b><u>Determine Hydrologic Conditions</u></b> <input type="checkbox"/> Groundwater elevation <input type="checkbox"/> Direction of groundwater flow <input type="checkbox"/> 25-Year flood level <input type="checkbox"/> 100-Year flood level

**Remarks:**

On November 5, 2020, a geologist with the Geological Survey Program (GSP) performed a geohydrologic evaluation for Missouri Prime Beef Packers in Pleasant Hope, Missouri. It is proposed that the facility's wastewater treatment needs will be served by a proposed lagoon, existing onsite lagoons, and the land application of waste. The purpose of the site visit was to observe the geologic and hydrologic elements of the site and determine the collapse potential and potential for groundwater contamination in the event of liner or wastewater treatment failure.

Ordovician-age Jefferson City-Cotter Dolomite was observed to crop out in the stream located southwest and west of the facility. The Jefferson City-Cotter Dolomite in this area typically exhibits high permeability at the surface with decreased permeability at depth. In this area, sandstone and dolomite are common to this formation. Surficial materials consist of silty and clayey residuum with chert and sandstone fragments. According to a soils report submitted to GSP staff after the site visit, surficial material thickness in the soil pits closest to the proposed lagoon (pits 1 and 9) ranges between 3 and 5 feet.

The land application sites evaluated were located north, west, and south of the proposed lagoon and are characterized by gentle hillslopes.

Surface water from the site flows west and north to tributaries of the Pomme de Terre River, in which the tributaries and Pomme de Terre River exhibit gaining characteristics. Based on the geologic and hydrologic characteristics observed, the site receives a moderate collapse potential rating, primarily due to the depth and size of the proposed lagoon, and moderate geologic limitation rating. Suitable material may be found on site for lagoon construction, but it is recommended to remove any rock fragments encountered. Limiting the depth of excavation may also be necessary to prevent encountering bedrock. Supplementing the existing soils with clay or installing a compacted clay pad may be needed if there is not enough suitable clay material found on site. In the event of lagoon collapse or wastewater treatment failure, regional groundwater contamination would be minimal, but shallow and local groundwater resources and surface water of Pomme de Terre River and its tributaries may be adversely impacted.



## Appendix C: Natural Heritage Review



### Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

### **Natural Heritage Review Level Three Report: Species Listed Under the Federal Endangered Species Act**

There are records for species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

**Foreword:** Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this website is to provide information to federal, state and local agencies, organizations, municipalities, corporations and consultants regarding sensitive fish, wildlife, plants, natural communities and habitats to assist in planning, designing and permitting stages of projects.

#### PROJECT INFORMATION

**Project Name and ID Number:** Missouri Prime Beef Packer #8216

**User Project Number:** 20-8259

**Project Description:** Project is a industrial beef processing plant. Plant will discharge water from butchering process into multi-celled lagoon which will then be spray irrigated over the project site.

**Project Type:** Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Drip or spray irrigation using waste effluent

**Contact Person:** William Johanning

**Contact Information:** [rjohanning@cochraneng.com](mailto:rjohanning@cochraneng.com) or 636-584-0540



**Disclaimer:** The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, Reports include information about records near but not necessarily on the project site.

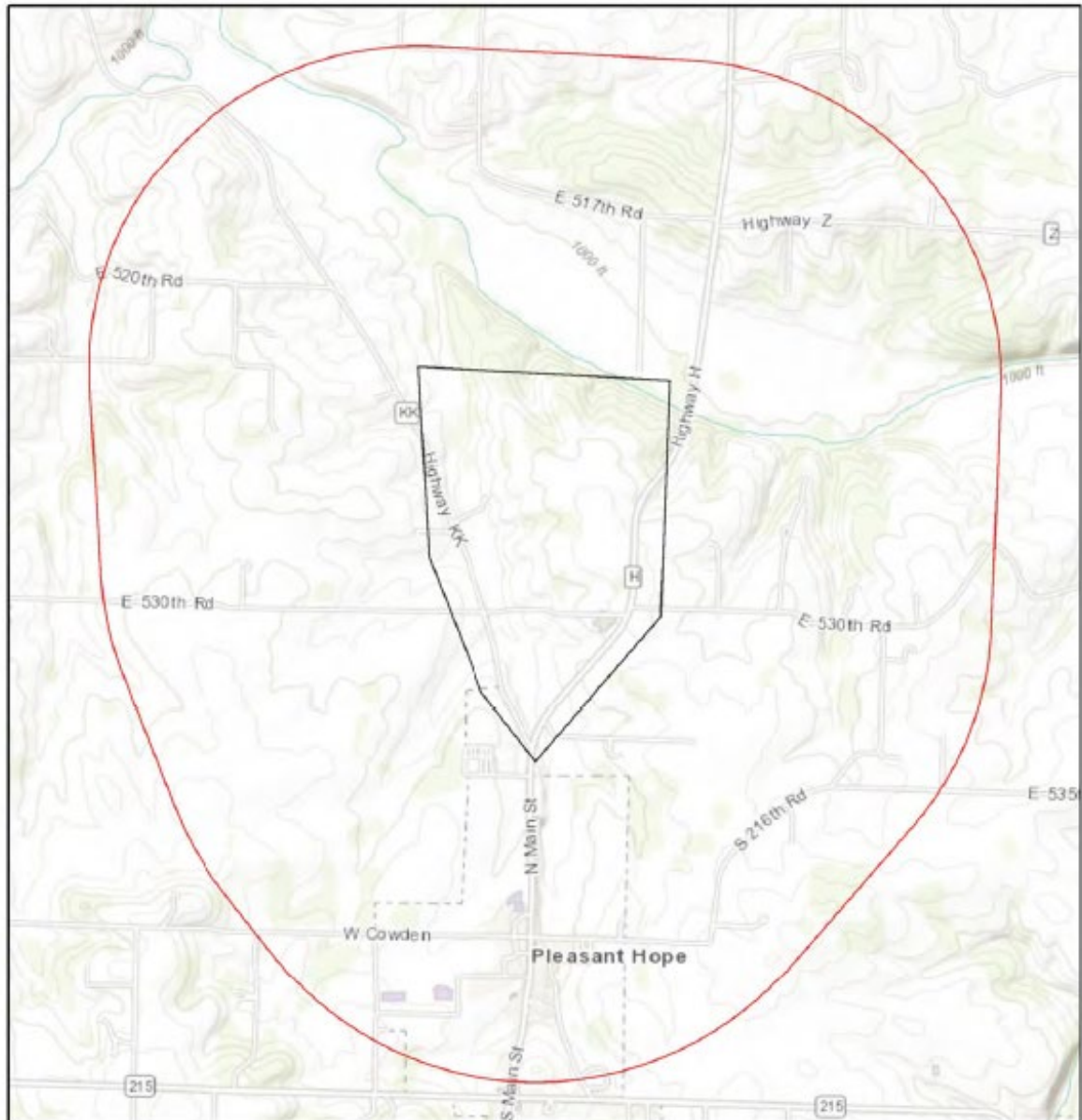
The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

**U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination:** Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. The information within this report is not intended to replace Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit the USFWS Information for Planning and Conservation (IPaC) website at <https://ecos.fws.gov/ipac/> for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.

**Transportation Projects:** If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or [www.modot.mo.gov/ehp/index.htm](http://www.modot.mo.gov/ehp/index.htm) for additional information on recommendations.

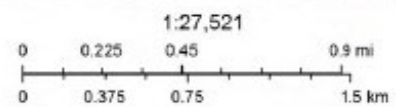


## Missouri Prime Beef Packer



October 19, 2020

- ☐ Project Boundary
- ☐ Buffered Project Boundary



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

#### Species or Communities of Conservation Concern within the Area:

There are records for species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

MDC Natural Heritage Review  
Resource Science Division  
P.O. Box 180  
Jefferson City, MO  
65102-0180  
Phone: 573-522-4115 ext. 3182  
[NaturalHeritageReview@mdc.mo.gov](mailto:NaturalHeritageReview@mdc.mo.gov)

U.S. Fish and Wildlife Service  
Ecological Service  
101 Park Deville Drive  
Suite A  
Columbia, MO  
65203-0007  
Phone: 573-234-2132

#### Other Special Search Results:

No results have been identified for this project location.

#### Project Type Recommendations:

**Waste Transfer, Treatment and Disposal -Liquid Waste Effluent: Drip or Spray Irrigation of Waste;** [Clean Water Act](#) permits issued by other agencies regulate both construction and operation of wastewater systems, and provide many important protections for fish and wildlife resources throughout the project area and at some distance downstream. Fish and wildlife almost always benefit when unnatural pollutants are removed from water, and concerns are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any "Clean Water Permit" conditions.

Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.

**Waste Transfer, Treatment and Disposal - Drip or Spray Irrigation Using Waste Effluent.** Clean Water Act permits issued by other agencies regulate both construction and operation of wastewater systems, and provide many important protections for fish and wildlife resources throughout the project area and at some distance downstream. Including buffers between effluent dispersal areas and waterways helps maintain healthy streams. Fish and wildlife almost always benefit when unnatural pollutants are removed from water, and concerns are reduced if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any "Clean Water Permit" conditions. Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza. Management Recommendations for Construction Projects Affecting Missouri Streams and Rivers is a Conservation Department publication available at <http://mdc.mo.gov/sites/default/files/resources/2013/02/constprojnearstr...>

#### Project Location and/or Species Recommendations:

**Endangered Species Act Coordination - Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and Northern long-eared bats (*Myotis septentrionalis*, federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April. If any trees need to be removed for your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 ext. 100 for Ecological Services) for further coordination under the Endangered Species Act.**



The project location submitted and evaluated is within the range of the Gray Myotis (i.e., Gray Bat) in Missouri. Depending on habitat conditions of your project's location, Gray Myotis (*Myotis grisescens*, federal and state-listed endangered) could occur within the project area, as they forage over streams, rivers, lakes, and reservoirs. Avoid entry or disturbance of any cave inhabited by Gray Myotis and when possible retain forest vegetation along the stream and from the cave opening to the stream. See <http://mdc.mo.gov/104> for best management recommendations.

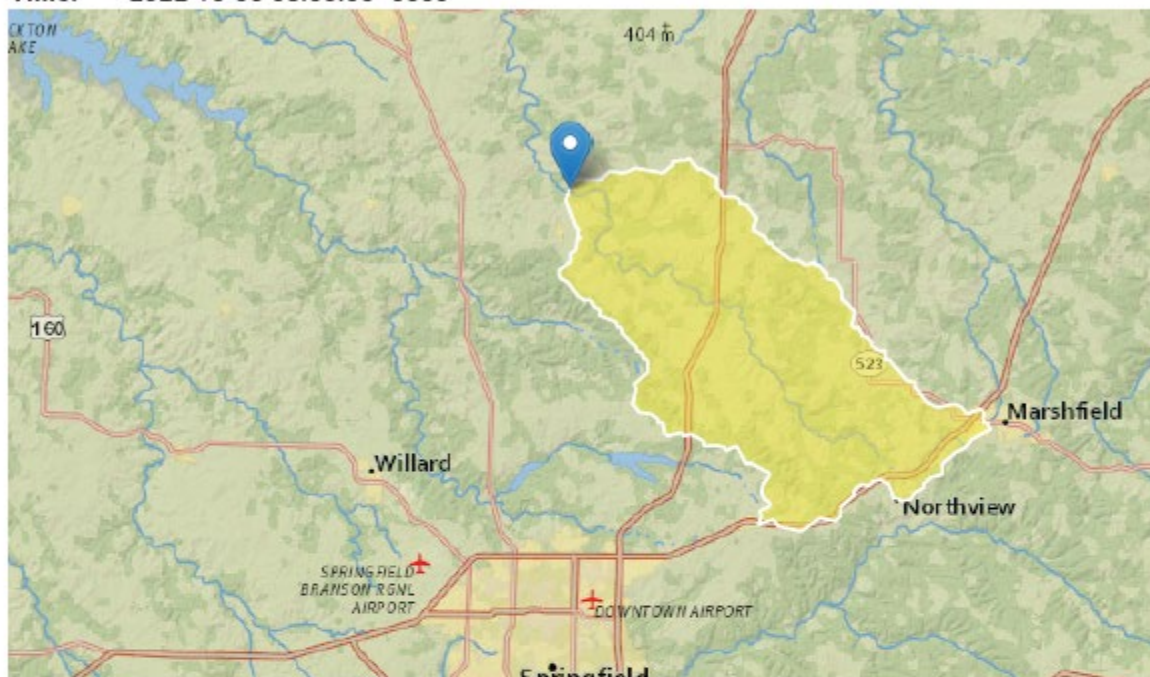
The project site submitted and evaluated is on or near Fish Spawning Stream Reaches Pomme de Terre River, one of 138 state-designated fish spawning stream segments. These stream reaches were so designated because they have highly diverse fish communities, fish Species of Conservation Concern present, and because they are important to maintaining, restoring, or avoiding future listing of Species of Conservation Concern. These stream reaches also are included as a Missouri Nationwide Permit Regional Condition (Number 2) that must be considered if working under a Clean Water Act Section 404 Permit issued by the U.S. Army Corps of Engineers

(<http://www.nwk.usace.army.mil/Missions/RegulatoryBranch/NationWidePermit...>). A list of all stream reaches is available at <http://www.nwk.usace.army.mil/Portals/29/docs/regulatory/nationwidepermi...>. Activities that alter or destabilize stream bottoms or banks should be avoided during the important fish spawning period for that stream, in order to not disrupt fish spawning (i.e., laying and fertilizing fish eggs.) The sensitive spawning period for this stream is March 15th to June 15th. At all times, avoid habitat destruction or introducing heavy sediment loads, chemical or organic pollutants.

## Appendix D: USGS Stream Stats Summary

### StreamStats Report for potential Pomme de Terre discharge

Region ID: MO  
Workspace ID: MO20221005130236040000  
Clicked Point (Latitude, Longitude): 37.48741, -93.26629  
Time: 2022-10-05 08:03:00 -0500



[+ Collapse All](#)

#### ➤ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	156	square miles
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.6	dimensionless

#### ➤ Low-Flow Statistics

**Low-Flow Statistics Parameters [LowFlow Region 2 SIR 2013 5090]**

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	156	square miles	0.21	7380
STREAM_VARG	Streamflow Variability Index from Grid	0.6	dimensionless	0.273	0.926

**Low-Flow Statistics Flow Report [LowFlow Region 2 SIR 2013 5090]**

Statistic	Value	Unit
1 Day 10 Year Low Flow	1.46	ft <sup>3</sup> /s
2 Day 10 Year Low Flow	1.62	ft <sup>3</sup> /s
3 Day 10 Year Low Flow	1.66	ft <sup>3</sup> /s
7 Day 10 Year Low Flow	1.79	ft <sup>3</sup> /s
10 Day 10 Year Low Flow	1.9	ft <sup>3</sup> /s
30 Day 10 Year Low Flow	2.37	ft <sup>3</sup> /s
60 Day 10 Year Low Flow	3.17	ft <sup>3</sup> /s

*Low-Flow Statistics Citations*

Southard, R.E., 2013, Computed statistics at streamgages, and methods for estimating low-flow frequency statistics and development of regional regression equations for estimating low-flow frequency statistics at ungaged locations in Missouri: U.S. Geological Survey Scientific Investigations Report 2013-5090, 28 p. (<http://pubs.usgs.gov/sir/2013/5090/>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

10/5/22, 8:04 AM

StreamStats

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.


Application Version: 4.10.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

DRAFT

**Appendix E: Antidegradation Summary Forms**

		<b>MISSOURI DEPARTMENT OF NATURAL RESOURCES</b> <b>WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH</b> <b>ANTIDEGRADATION REVIEW SUMMARY / REQUEST</b>		<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <b>RECEIVED</b>  NOV 17 2022 </div>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left; padding: 2px;">FOR DEPARTMENT USE ONLY</th> </tr> <tr> <td style="padding: 2px;">APP NO. <u>2</u></td> <td style="padding: 2px;"></td> </tr> <tr> <td style="padding: 2px;">FEE RECEIVED <u>\$250.00</u></td> <td style="padding: 2px;">CHECK NO. <u>46434</u></td> </tr> <tr> <td colspan="2" style="padding: 2px;">DATE RECEIVED <u>11-17-22 JB</u></td> </tr> </table>	FOR DEPARTMENT USE ONLY		APP NO. <u>2</u>		FEE RECEIVED <u>\$250.00</u>	CHECK NO. <u>46434</u>	DATE RECEIVED <u>11-17-22 JB</u>	
FOR DEPARTMENT USE ONLY													
APP NO. <u>2</u>													
FEE RECEIVED <u>\$250.00</u>	CHECK NO. <u>46434</u>												
DATE RECEIVED <u>11-17-22 JB</u>													
<b>1. FACILITY</b>													
NAME Missouri Prime Beef Packers				COUNTY Polk									
ADDRESS (PHYSICAL) 5305 Highway H		CITY Pleasant Hope		STATE MO	ZIP CODE 65725								
PERMIT NUMBER MO-0113204		PROPOSED DESIGN FLOW 350,000		SIC / NAICS CODE 2011									
<b>2. OWNER</b>													
NAME SDNG, LLC													
ADDRESS 5305 Highway H		CITY Pleasant Hope		STATE MO	ZIP CODE 65725								
EMAIL ADDRESS npaschkov@mpbeef.com				TELEPHONE NUMBER WITH AREA CODE 208-989-4292									
<b>3. CONTINUING AUTHORITY</b> The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(2).													
NAME Missouri Prime Beef Packers		SECRETARY OF STATE CHARTER NUMBER FL1433370											
ADDRESS 5305 Highway H		CITY Pleasant Hope		STATE MO	ZIP CODE 65725								
EMAIL ADDRESS npaschkov@mpbeef.com				TELEPHONE NUMBER WITH AREA CODE									
<b>4. CONSULTANT</b>													
PREPARER NAME William Johanning		COMPANY NAME Cochran Engineering											
ADDRESS 530A East Independence Drive		CITY Union		STATE MO	ZIP CODE 63084								
EMAIL ADDRESS rjohanning@cochraneng.com				TELEPHONE NUMBER WITH AREA CODE 636-584-0540									
<b>5. RECEIVING WATER BODY SEGMENT #1</b>													
NAME Tributary to Pomme de Terre River													
5.1 Upper end of segment – Location of discharge UTM: X= 476416.25, Y= 4148995.52 OR Lat _____, Long _____													
5.2 Lower end of segment – UTM: X= 476306.44, Y= 4149053.30 OR Lat _____, Long _____													
Per the Missouri Antidegradation Implementation Procedure (AIP), the definition of a segment, "a segment is a section of water that is bound, at a minimum, by significant existing sources and confluences with other significant water bodies."													
<b>6. WATER BODY SEGMENT #2 (IF APPLICABLE, Use another form if a third segment is needed)</b>													
NAME													
6.1 Upper end of segment – End of Segment #1 UTM: X= _____, Y= _____ OR Lat _____, Long _____													
6.2 Lower end of segment – UTM: X= _____, Y= _____ OR Lat _____, Long _____													
<b>7. DECHLORINATION</b>													
If chlorination and dechlorination is the existing or proposed method of disinfection treatment, will the effluent discharged be equal to or less than the Water Quality Standards for Total Residual Chlorine stated in Table A1 of 10 CSR 20-7.031?													
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No – What is the proposed method of disinfection? SEBS removal of pathogens													
Based on the disinfection treatment system being designed for total removal of Total Residual Chlorine, minimal degradation for Total Residual Chlorine is assumed and the facility will be required to meet the water quality based effluent limits. These compliance limits for Total Residual Chlorine are much less than the method detection limit of 0.13 mg/L.													



Surface Land Application by spray irrigation was analyzed and designed previously to match existing treatment of the facility. Overall cost of the irrigation piping system was deemed too high with the daily maintenance of operation. Other alternatives were evaluated and deemed viable and cost effective for the facility and to protect water sources of discharge.

☒ Copy of the Geohydrologic Evaluation – Submit request through the Missouri Geological Survey website

☒ Copy of the Missouri Natural Heritage from the Missouri Department of Conservation website

☒ Attach your Antidegradation Review Report and all supporting documentation as these forms are only a summary.

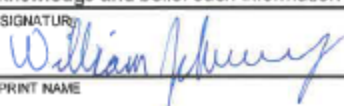
☐ If applicable, submit a copy of any Existing Water Quality data used in this process. Include the date range of the data, source(s) of the data, and location of data collection relative to the outfall. If using your own collected water quality data, submit a copy of the Quality Assurance Project Plan (QAPP) approved by the department's Watershed Protection Section. For more detailed information, see the Missouri Antidegradation Implementation Procedure (AIP), Section II.A.1.

Path A: Tier 2 – Non-Degradation Mass Balance	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Path B: Tier 2 – Minimal Degradation	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Path C: Tier 2 – Significant Degradation	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Path D: Tier 1 – Preliminary Review Request	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Path E: Temporary Degradation	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Preliminary effluent limits for the proposed project are dependent upon the path selected:

[illegible]

\* Place an X in appropriate box for the concentration units for each Pollutant of Concern.

<b>12. PROPOSED PROJECT SUMMARY</b>	
<p>The existing three cells used for storage for the land application permit authorized to Missouri Prime Beef Packers will be retrofitted with the ILEAF technology for treatment. SEBS microbial organisms will be dosed at the influent of each cell. Flows through the system will be Cell #3 to Cell #1 to Cell #2 to a collection lift station and discharged to the Pomme de Terre River. The microorganisms will digest BOD, TSS, ammonia, and phosphorus. The microbials will also eliminate solids and other matter from the wastewater influent. In the final Cell #2, additional SEBS will be dosed to eliminate e. coli and fecal coliform, eliminating the need for traditional disinfection. Flows will be conveyed from the treatment facility to the Pomme de Terre River discharge location.</p>	
<p>Applicants choosing to use a new wastewater technology that are considered an "unproven technology" in Missouri must comply with the requirements set forth in the <i>New Technology Definitions and Requirements fact sheet</i>.</p>	
<b>13. CONTINUING AUTHORITY WAIVER (For New Discharges)</b>	
<p>In accordance with 10 CSR 20-6.010(2)(C), applicants proposing use of a lower preference continuing authority, when the higher level authority is available, must submit a waiver from the existing higher authority one or other documentation for the department's review, provided it does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or by the Missouri Clean Water Commission. Is the waiver necessary? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, provide a copy.</p>	
<b>14. APPLICATION FEE</b>	
<input checked="" type="checkbox"/> CHECK NUMBER 46434	<input type="checkbox"/> JETPAY CONFIRMATION NUMBER
<b>15. SIGNATURE</b>	
I am authorized and hereby certify that I am familiar with the information contained in this document and to the best of my knowledge and belief such information is true, complete and accurate.	
SIGNATURE 	DATE 11/9/2022
PRINT NAME William Johanning	TITLE Consulting Engineer
PLEASE IDENTIFY YOUR STATUS FOR THIS PROJECT: <input type="checkbox"/> OWNER <input type="checkbox"/> CONTINUING AUTHORITY <input checked="" type="checkbox"/> CONSULTANT	



## Water Protection Program

## NAME \_\_\_\_\_

Missouri Prime Beef Packers

COUNTY

Polk

Pollutants of Concern to be considered include those pollutants reasonably expected to be present in the discharge per the Antidegradation Implementation Procedure Section II.A. and assumed or demonstrated to cause significant degradation. The tier protection levels are specified and defined in rule at 10 CSR 20-7.031(2).

What are the proposed pollutants of concern and their respective effluent limits that the selected treatment option will comply with:

[illegible]

\*\* Provide the Basis for the Base Case Limit: WQS – Water Quality Standard, WLA – Wasteload Allocation, ELG – Effluent Limit Guideline, or describe other.

Supply a summary of the non-discharging alternatives considered. "For Discharges likely to cause significant degradation, an analysis of non-degrading and less-degrading alternatives must be provided," as stated in the Antidegradation Implementation Procedure Section II.B.1. These alternatives include no-discharge. Attach all supportive documentation in the Antidegradation Review report.

**Feasibility of non-discharging alternatives** (regionalization, land application, subsurface irrigation, and recycling or reuse):

Regionalization and Land Application were considered. Regionalization was not feasible due to constructing a regional plant would have similar costs to upgrading the current facility to meet new effluent limits. Land Application is no longer feasible due to high cost of piping for irrigation system. Design flow was also unachievable to be maintained and operated by staff at the facility.

Minimum of three (preferably five or more) discharging alternatives* ranging from less-degrading to degrading including Preferred Alternative (All treatment levels for POCs must at a minimum meet water quality standards):		
Discharging Alternative #	Treatment Type	Description
1		
2		
3	SAGR - Attach Growth Reactor	Bacteria attach to media to aid in nitrification process
4	Schreiber CSBR	Suspended growth nitrifiers attach to flocs to remove ammonia
5	ILEAF	Microbial Treatment for ammonia removal
6		
* Same technology may be multiple alternatives as you have the base unit and add to it with more capacity to provide additional treatment.		
<b>4. DETERMINATION OF THE REASONABLE ALTERNATIVE</b>		
Per the Antidegradation Implementation Procedure Section II.B.2, "a reasonable alternative is one that is practicable, economically efficient and affordable." Provide basis and supporting documentation in the Antidegradation Review report. <b>Please do not write "See Report" for any box below.</b>		
<b>Practicability Summary:</b> <p>"The practicability of an alternative is considered by evaluating the effectiveness, reliability, and potential environmental impacts," according to the Antidegradation Implementation Procedure Section II.B.2.a. Examples of factors to consider, including secondary environmental impacts, are given in the Antidegradation Implementation Procedure Section II.B.2.a.</p> <p>The effectiveness and reliability of the alternatives were discussed and reviewed to meet water quality standards that would not degrade the Pomme de Terre River. The technology evaluated limits of alternatives discussed provide reliable and consistent discharges from the facility. Evaluation of providing a cost effective solution, either by utilizing the existing facility or by construction of a new plant, was reviewed and found that discharging Alternative #5 would be the most affordable and practicable for the industrial waste being produced by the processing facility.</p>		
<b>Economic Efficiency Basis:</b> <p>What is the design life cycle for the comparison? 20 years</p> <p>What interest rate was used in the present worth calculations? 5%</p>		
<b>Economic Efficiency Summary:</b> <p>Alternatives that are deemed practicable must undergo a direct cost comparison in order to determine economic efficiency. Means to determine economic efficiency are provided in the Antidegradation Implementation Procedure Section II.B.2.b.</p> <p>Cost comparison evaluated a life cycle of 20 years at a present worth of 5%. Cost evaluated utilizing the existing facility structures for treatment and cost of construction of a new treatment facility. Cost comparison also included pretreatment costs, discharging costs to the Pomme de Terre River, disinfection, and annually operation and maintenance costs for the treatment alternatives. The facility would also need to retain a certified operator for the discharging alternatives which would add to operational cost of alternatives 3 and 4. The staff at the facility can operate alternative 5, but certification for operation would need to be obtained by the staff. Alternative 5 was found to be the most economic efficient for the beef processing facility.</p>		

TABLE OF THE ALTERNATIVES EVALUATION (Attach additional page if necessary)						
PARAMETERS	Alternatives #					
	1	2	3	4	5	6
BOD <sub>5</sub> – mg/L			2-10	<30	<30	
TSS – mg/L			2-10	<30	<30	
Ammonia (Summer) – mg/L			0-1	3-5	3-5	
Ammonia (Winter) – mg/L			1-5	3-5	3-5	
E. Coli – #/100 mL					<126	
Total Nitrogen – mg/L						
Total Phosphorus – mg/L				<1	<1	
Construction Cost – \$			7,397,757	8,507,932	2,266,055	
Operating Cost – \$			114,622	162,881	60,800	
Present Worth – \$			8,826,197	10,537,786	3,023,757	
Ratio present worth to base case			2.92	3.48	1	
<b>Affordability Summary:</b> Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis. An affordability analysis per the Antidegradation Implementation Procedure Section II.B.2.c, "may be used to determine if the alternative is too expensive to reasonably implement." Utilization of the existing land application storage basins for treatment of the effluent waste provided an affordable solution to construction of new treatment plants. The processing facility is a private entity and not subject to receiving funds from public areas. Alternative 5 was deemed the most efficient and most cost effective solution for treating discharges.						
<b>Justification for Preferred Alternative:</b> Cost associated with preferred alternative is most economical to the Owner. Operation and maintenance cost for Owner currently for land application is exceeding budget and under performing. Cost of upgrading irrigation system is in par with cost of construction of a discharging facility. Efficiency of treatment and cost projections limit production line cuts to pay for the improvements to the processing facility.						
<b>Reasons for Rejecting the other Evaluated Alternatives:</b> Large land footprint needed for the underground SAGR System exceeds cost of the retrofitting existing storage basins for treatment. The cost of constructing a completely new concrete Schreiber CSR plant exceeds economic cost of Owner. Cost of operation and maintenance of the mechanical plants along with retainer of an operator familiar with the plant designs would outweigh that of the ILEAF system.						
<b>Comments/Discussion:</b>						

**5. SOCIAL AND ECONOMIC IMPORTANCE OF THE PREFERRED ALTERNATIVE**

If the preferred alternative will result in significant degradation, then it must be demonstrated that it will allow important economic and social development in accordance to the Antidegradation Implementation Procedure Section II.E. Social and Economic Importance is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanding discharge.

**Identify the affected community:**

The affected community is defined in 10 CSR 20-7.031(2)(B) as the community "in the geographical area in which the waters are located. Per the Antidegradation Implementation Procedure Section II.E.1, "the affected community should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project."

The processing facility currently employs many of those in the surrounding area. Reduction in the ability to discharge or eliminate liquid waste will reduce overall production at the facility. The production loss would result in layoffs of those on the processing line. Retail businesses in the area would in turn suffer from goods not being purchased from those working at the processing plant. Down market affects of the processing facility, loss in production or halting completely, would result in food shortages to the areas supplied from the processing facility.

**Identify relevant factors that characterize the social and economic conditions of the affected community:**

Examples of social and economic factors are provided in the Antidegradation Implementation Procedure Section II.E.1., but specific community examples are encouraged.

The beef processing facility is one of the largest employers in the area. Halting of production at the facility due to inability to remove waste would affect not only those working at the facility, but those that supply materials to the facility and those who support the workers (i.e. grocery stores, gas stations, and schools). The down-market effect of not having beef products available in stores would be wide scale in the areas supplied by the processing plant. Food shortages could result from the halting of production.

**Describe the important social and economic development associated with the project:**

Determining benefits for the community and the environment should be site specific and in accordance with the Antidegradation Implementation Procedure Section II.E.1.

By utilizing a central discharge point, the chance of over saturation of the fields and the possibility of surface run-off to the nearby water sources would be eliminated. The proper treatment and effluent limits met by discharging plant will aid in the environmental protection of the streams. This would aid nearby farmers utilizing the streams for irrigation of crops and watering of animals.

**PROPOSED PROJECT SUMMARY:**

The existing three cells used for storage for the land application permit authorized to Missouri Prime Beef Packers will be retrofitted with the ILEAF technology for treatment. SEBS microbial organisms will be dosed at the influent of each cell. Flows through the system will be Cell #3 to Cell #1 to Cell #2 to a collection lift station and discharged to the Pomme de Terre River. The microorganisms will digest BOD, TSS, ammonia, and phosphorus. The microbials will also eliminate solids and other matter from the wastewater influent and at the bottom of each lagoon cell. In the final treatment Cell #2, additional SEBS will be dosed to eliminate e. coli and fecal coliform, eliminating the need for traditional disinfection. Flows will be conveyed from the treatment facility to the Pomme de Terre River discharge location.

Attach the Antidegradation Review report and all supporting documentation. This is a technical document, which must be signed, sealed and dated by a registered professional engineer of Missouri.



MISSOURI DEPARTMENT OF NATURAL RESOURCES  
 WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH  
**ANTIDEGRADATION: REGIONALIZATION AND NO-DISCHARGE EVALUATION**

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 Water Protection Program

**REGIONALIZATION AND NO-DISCHARGE EVALUATION**

According to the Antidegradation Implementation Procedure Sections I.B. and II.B.1., the feasibility of no-discharge alternatives must be considered. No-discharge alternatives may include connection to a regional treatment facility, surface land application, subsurface land application, and recycle or reuse.

Please refer to the *No-Discharge Alternative Evaluation* fact sheet for examples of information to provide to justify common reasons for not pursuing regionalization or no-discharge land application. If sufficient information is not provided on this form to demonstrate that these alternatives are not feasible, a more detailed evaluation of no-discharge options may have to be submitted.

Additional pages may be attached if more room is needed.

**1. FACILITY:**

NAME

Missouri Prime Beef Packers

COUNTY

Polk

**2. EVALUATION OF REGIONALIZATION** (Complete all applicable reasons why regionalization was not pursued)

**2.1 Regionalization Feasibility:**

- A. What is the distance to connect to the closest municipality's line or other facility's line? 0.61 miles
- B. List facilities contacted about possible regionalization. None
- C. Is there any planning or zoning in the area regarding development and services? No
- D. Who would have the responsibility to maintain the sewer connection line? Missouri Prime Beef Packers
- E. What is the estimated cost for piping and pumps to regionalize? N/A
- F. Explain any engineering challenges with the regionalization connection – topography, rivers, highways, or other issues.  
 Existing Pleasant Hope WWTF is undersized and would need to be upgraded to meet new limits.
- G. Does a regional facility have the capacity to treat the additional effluent from this project? No
- H. Were land owners contacted for rights to an easement? ☐ Yes ☒ No
- I. Describe the easement issues:  
 N/A

**2.2 Summarize why regionalization was not a practicable or economically efficient alternative**

Existing Pleasant Hope WWTF is a two cell lagoon with (2) overland flow beds. The facility would need upgrades and upsizing to handle the additional flows. There was limited space for expansion at the Pleasant Hope Facility.



**3. EVALUATION OF NO-DISCHARGE LAND APPLICATION**

Check all applicable reasons why no-discharge land application was not pursued:

☐ **3.1 Land Availability and Cost:**

- A. Is land available for land application?
- ☒
- Yes
- ☐
- No

If not, explain:

If yes, answer the following:

- B. How many acres are required for land application of the effluent? 108

- C. Provide a breakdown of the capital cost for any necessary additional land, piping, pumps, and irrigation equipment?

Project received bid of approximately \$5,000,000 for land application system.

- D. Were long-term costs evaluated and compared for upgrading to a mechanical plant with future Water Quality Standards changes (i.e. mussel ammonia, bacteria, TP, TN) versus cost for a land application system? ☒ Yes ☐ No
- E. Were land owners contacted for rights to an easement? ☐ Yes ☒ No
- F. Describe the easement issues:

No easements are needed for land application.

☐ **3.2 Zoning or Suitability of Site in Proximity to Neighboring Sites or Waterbodies:**

- A. Was drip or subsurface irrigation evaluated as opposed to surface application? ☐ Yes ☒ No
- B. Does the county ordinance specifically restrict land application, surface and subsurface? ☐ Yes ☒ No
- C. Can a vegetated buffer be installed to reduce necessary buffer distances? ☐ Yes ☒ No
- D. Are there other steps or considerations that can be made?

No.

☐ **3.3 Unsuitability of Geology or Soils**

- A. Is a geohydrologic evaluation, county soils survey map, or other resource showing suitability and application rates included with this application? ☒ Yes ☐ No
- B. Is it cost-effective to bring in additional soils? ☐ Yes ☒ No
- C. Can the application rate be decreased to a suitable rate? ☐ Yes ☒ No
- D. Were subsurface application alternatives (e.g. low pressure pipe, drip) considered? ☐ Yes ☒ No
- E. If collapse potential is a concern, was using a liner or alternative site evaluated? ☐ Yes ☒ No

**3.4 Summarize why no-discharge land application was not a practicable or economically efficient alternative**

Cost for upgrading land application system to accommodate 350,000 gpd was found to be on par with construction of a mechanical treatment plant with price escalation of PVC pipe during supply chain crisis. Land application maintenance and man-power was above the facilities capabilities for daily operations for the flow experienced at the facility.

#### 4. DOCUMENTATION

4.1 Is any other written correspondence or documentation included with this application to provide further justification for not pursuing a no-discharge option or regionalization?

☒ No

☐ Yes:

- ☐ A letter from an existing higher preference continuing authority waiving preferential status where service is not available in accordance with 10 CSR 20-6.0 10 (2) or if capacity is not available.
- ☐ A letter from the existing higher preference continuing authority stating that the regional facility has no interest in taking flow from the new or expanded facility.
- ☐ A letter from the regional municipality stating that the project area is outside city limits and annexation would be required.
- ☐ Council meeting minutes.
- ☐ Correspondence with land owners regarding easement rights.
- ☐ Correspondence with land owners regarding land for sale or lease.
- ☐ Letters from the community or a consulting engineer regarding availability, proximity, and location of suitable land and the reasonable cost of such land.
- ☐ Documentation of recent land sales or appraisals.
- ☐ Calculations for sizing a land application system.
- ☐ Detailed cost estimates for a land application system or regionalization including lift stations, piping, easements, liners, and/or connection costs.
- ☐ Geohydrologic evaluation or other soils report.
- ☐ Copy of a county or city ordinance.
- ☐ Verification of funding from State Revolving Fund, which does not fund projects outside city limits.
- ☐ Other: